HUI MĀLAMA O PŪPŪKEA-WAIMEA

AWARNESS-RAISING & OUTREACH VOLUNTEER HANDBOOK

PŪPŪKEA MARINE LIFE CONSERVATION DISTRICT

Updated March 2006

Aloha and welcome!

Thank you for volunteering to better Malama our beautiful neighborhood Marine Life Conservation District (MLCD). Your valuable and dedicated involvement is essential in protecting the three areas of the MLCD: Waimea Bay, Kalua-Maua (Three Tables), and Pūpūkea (Sharks Cove). You are joining a hui of motivated and energetic partners who are working to replenish and sustain the natural and cultural resources of the Pūpūkea and Waimea ahupua'a. Since the Pūpūkea MLCD is one of the most highly visited tourist destinations in the world, the potential to reach neighbors and visitors alike is tremendous. As a volunteer, you will be spending time in one of the most beautiful places on earth while positively influencing the behaviors and attitudes of everyone who visits the MLCD. Thank you for creating a healthier Hawai'i.

"E PULAMA I KO KAKOU HO'OLINA"
"LET US CHERISH OUR RICH HERITAGE"

Mālama pono,
Butch Helemano, Project Coordinator
Kamaki Worthington, Observation and Compliance Coordinator

"Working to replenish and sustain the natural and cultural resources of both the Pūpūkea and Waimea ahupua'a for present and future generations through active community stewardship, education and public and private partnerships."

Table of Contents

Project Background

The land and marine areas of Pūpūkea, Waimea Valley, and Waimea Bay are extremely important biologically, socially, economically, and culturally. The Pūpūkea Marine Life Conservation District (MLCD) is a major feature of this area and is designed to conserve marine life and provide educational and recreational opportunities for residents and visitors.

NO MALL AT SHARKS COVE

When development of a mall was proposed for Sharks Cove, a group of North Shore residents, along with many conservation-minded individuals, formed a group called The Friends of Sharks Cove. The slogan "No mall at Sharks Cove" became the group's rally cry. Hundreds of supporters united against the proposed shopping mall complex, which would have been located across the street from the Pūpūkea MLCD. Spearheading the efforts for enhanced conservation in the area, residents Cora Sanchez and Blake McElheny joined forces to stop unchecked development and prevent future impacts to our wonderful environment.

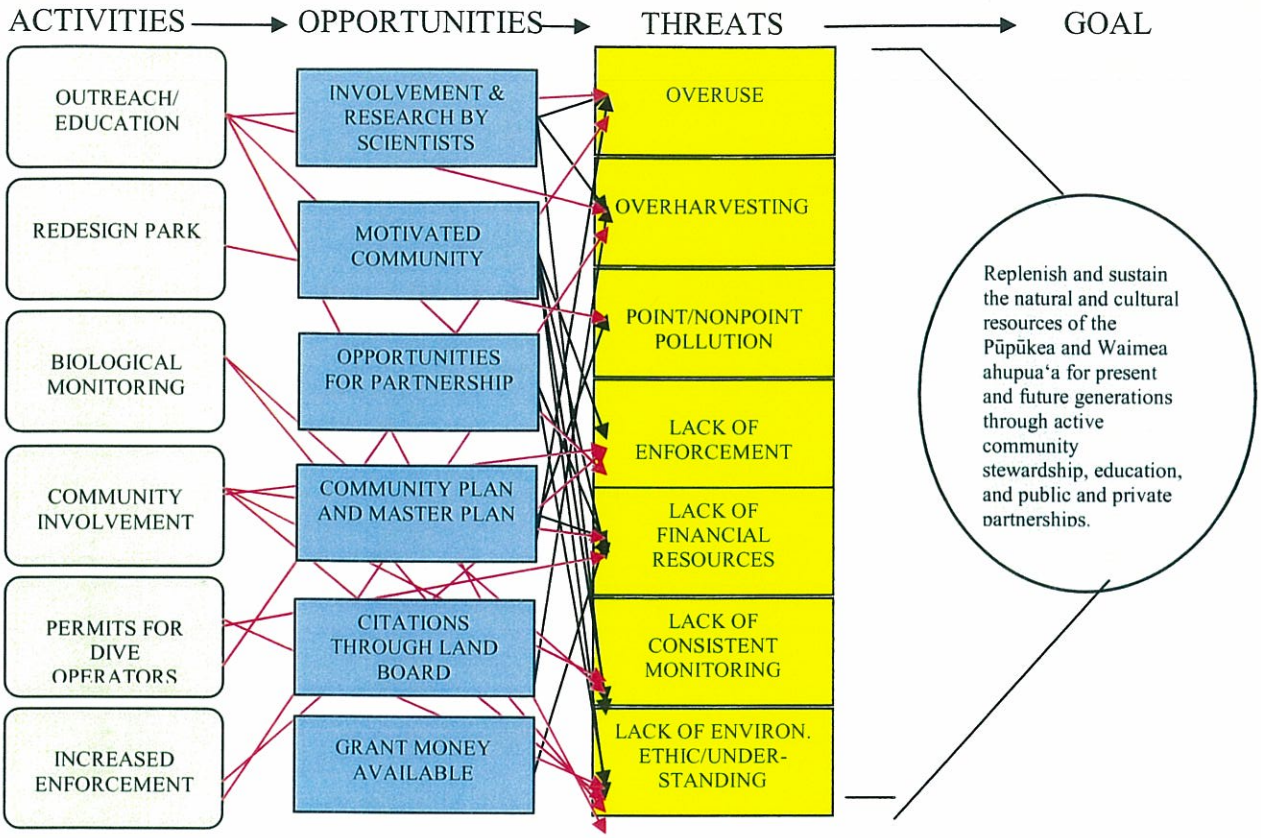
HUI MĀLAMA O PŪPŪKEA-WAIMEA

In January 2005, Cora and Blake gathered together a group of community stakeholders to discuss how to curtail future impacts and sustain the natural resources of the MLCD, which also includes Waimea Bay and Kalua Māua (Three Tables). Blake introduced the group to the Community Conservation Network (CCN). CCN has experience helping coastal communities in Hawaii and the Asia-Pacific region with community-based marine conservation and management projects.

In April 2005, 22 individuals with an interest in the MLCD and surrounding area met and crafted a vision for the future of Pūpūkea and Waimea ahupua'a, identified opportunities to further enhance the management of the area, discussed ongoing threats and obstacles to effective management, and identified activities that could be pursued by the community in cooperation with the State to help enhance management and overcome the threats and obstacles. The newly formed group, called the Hui Mālama o Pūpūkea-Waimea, created the following vision and mission statement:

Replenish and sustain the natural and cultural resources of both the Pūpūkea and Waimea Ahupua'a for present and future generations through active community stewardship, education, and public and private partnerships.

The identified threats, opportunities, and possible activities are presented below:



MAKAI WATCH

Based on the identified possible activities, the group decided to implement a Makai Watch project, which was developed by CCN and other non-profit organizations in partnership with DLNR. The project aims to enhance management of the MLCD with the community's assistance in three areas: (1) raising awareness about the MLCD among those who use it, (2) collecting information on the MLCD's biological resources and human use of those resources, and (3) encouraging compliance with regulations.

An Overview of Makai Watch

Makai Watch: What It Is and What It Is Not

The Makai Watch Program is a partnership effort between the Department of Land and Natural Resources (DLNR) and several non-governmental organizations including the Community Conservation Network (CCN), the Nature Conservancy (TNC), the Hawaii Wildlife Fund (HWF), and several community-based organizations. The goal of Makai Watch is to enhance the management of near-shore marine resources by providing community members an opportunity to become directly involved in this management.

Makai Watch is a means for concerned citizens like yourselves to play a role in ensuring proper management of marine resources. The program is currently focused on specific communities rather than citizens at large. Any community that meets the Makai Watch criteria explained below can participate. Makai Watch is focused on reducing inappropriate use of marine resources by raising awareness, encouraging compliance, and—in cases of severe or persistent violations—helping to collect information that the Division of Conservation and Resource Enforcement (DOCARE) can use to identify and site violators. Through this combination of encouraging compliance and providing information to enforcement officers, Makai Watch will reduce inappropriate uses of marine resources, thus helping Hawaii's near-shore marine ecosystem to recover.

Makai Watch projects are established by specific communities with technical assistance from DLNR and one of the participating NGOs. Community members are responsible for organizing themselves, recruiting participants for the project, attending training, and then implementing Makai Watch elements. While technical assistance on all aspects of Makai Watch may be available, the community must be the primary mover behind its Makai Watch project.

The program consists of the three main components explained below. Each of these components has a training element. Volunteers may choose to participate for all three components—or one or two.

- *Awareness Raising and Outreach:* Makai Watch will train community members in high-priority coastal areas to provide information about marine ecology, regulations, best fishing practices, and other items important to their area. These outreach efforts will likely reduce the misuse of marine resources as resource users become more aware of both the law and local best practices to conserve marine resources.

- *Biological and Human Use Monitoring:* To encourage continued community participation, it is important that community members understand the condition of marine resources, how they are being used, and how they change over time. Makai Watch volunteers will learn how to collect information on human use of marine resources (fishing, kayaking, collecting, etc.) and on the biological condition of those resources. Over time, they will see the results of their management actions.

- *Observation and Compliance:* While awareness-raising and outreach will help to reduce illegal activities, poaching is likely to continue in some areas. To reduce the willful disregard for laws and regulations governing marine resource use, local community members will be trained in how to observe and identify illegal activities, and will have a direct relationship with DOCARE so that they can immediately report violations. They will also be trained in how to collect evidence so that they can help DOCARE build a strong case against violators.

While Makai Watch will improve the protection of Marine Resources, Makai Watch is not an enforcement program. Makai Watch volunteers do not have enforcement powers and are asked not to approach violators of regulations, primarily because of safety concerns. Instead, Makai Watch participants act as "eyes and ears" for DOCARE by observing violators, collecting information about the violation, and reporting to DOCARE. In cases of repeat or severe violations, Makai Watch participants call DOCARE right away and, if available, a DOCARE Officer will respond.

Makai Watch is not a substitute for the government in educating the public about marine resources and in enforcing resource regulations. Government will continue to play these roles; however, Makai Watch will help Government to enhance their efficacy.

The Origin of the Makai Watch Program

The DLNR Makai Watch Program was formally created as part of the DLNR Mauka-Makai Watch Program in January 2005. This guide focuses on the Makai Watch efforts primarily because of the interest of NGOs involved in its development, with recognition that Mauka-Makai Watch projects may be developed by the community in the future.

The concept of Makai Watch grew primarily from the interest of several communities to play a more significant role in the in-field management of their marine resources. These communities include Miloli'i and Wai Opae on the Big Island and Ahihi Kina'u on Maui. Over the past three years, with the support of DLNR and NGOs, each of these communities has developed a project to involve community members in marine resources management activities. In large part, these projects have provided the experience and lessons from which the Makai Watch initiative has been built.

In addition to the communities mentioned, a number of other communities around the Main Hawaiian Islands are becoming increasingly involved in marine management. The Community Conservation Network and our partners are working to support these community efforts through the creation of an exchange and learning network, which held its first workshop in December 2003. At this workshop, the Nature Conservancy, the Community Conservation Network, and the Hui Mālama O Mo'omomi brought together over 45 representatives of coastal communities in Hawaii to share lessons and exchange ideas about how to enhance the management of marine resources in their areas. One of the priorities the participants named was to enhance the role of the communities in direct management and protection.

Criteria for Establishing a Makai Watch Project

For a community to establish a Makai Watch Project, the following elements must be in place:

1. Motivated community members to start up the program, organize community volunteers, work with the support of NGOs and DLNR to identify the program goals, threats, and strategies to address those threats, and raise funds to support the program.
2. A geographically definable marine area, including but not limited existing marine managed areas such as a Marine Life Conservation District (MLCD) or Fisheries Management Area (FMA).
3. Broad community support and people who are willing to volunteer with the program.
4. An interest in and ability to raise public and private funds for the project.
5. Agreement with DLNR that the Department has sufficient capacity to help support the effort. It is particularly important that the local DOCARE office have capacity to support the development of Makai Watch in that community.

Makai Watch Training

The following outlines the basic training topics under each component.

1. Awareness Raising and Outreach

An important part of any Makai Watch program is raising awareness of the public to the importance of the area, its ecology, history, culture, and the regulations that are in place in the area. Many visitors to marine areas know very little about the area. They may be unfamiliar with how to care for the area, how to provide the appropriate cultural respect, and may not know about the regulations in place. As a result, they may inadvertently break laws or carry out behaviors that are damaging or disrespectful. Makai Watch focuses on caring for an area first and foremost by raising awareness among users of the area. Training under this component includes the following topics:

i. A brief history of the area, including…
- Historical uses
- The date and objectives of MLCD designation
- Any changes to the area's status and the reason for these changes
- Interesting historical facts

ii. The traditional and current culture of the area, including…
- Hawaiian uses of the area and significance
- Cultural practices that should be followed and respected
- Legends or stories about the area
- The current cultural significance of the area, with an emphasis on Hawaiian culture but with reference to any other cultures that use the area as well

iii. Functions of MLCDs: It is important that ocean users understand why MLCDs are designated. Possibilities include…
- Providing recreational opportunities
- Protecting ecosystem functions and biodiversity
- Improving fish catch through spillover and larval transport

iv. The laws that govern the area, including…
- Regulations that are specific to the area
- Regulations that apply to any marine life in Hawaii and therefore are also included in the area

v. How to approach ocean users. The best way to become comfortable with awareness raising and outreach is through practice. It's best to work in twos and threes and to include a participant that is very comfortable with approaching ocean users. The more experienced individual should approach an ocean user first, and then the less experienced individual should approach the next.

vi. Ecology, including details regarding…
- the dominant ecosystem
- the types of organisms that are likely to be encountered
- the ahupua'a concept—the relationship between the land and sea
- the current status of the area in terms of resources
- organisms that may be dangerous and have potential to harm visitors
- organisms that are sensitive and should be avoided to ensure that visitors do not harm them

vii. Responsible or Pono Behavior: Ocean users need to know what type of behavior is considered appropriate or responsible for the area, including...

- How to conduct yourself in the water—i.e., not trampling coral, not harassing turtles and marine life
- What to take or not take, out of respect for the local community. If your community has traditional practices that are considered Pono, or appropriate, most ocean users will appreciate knowing them. For example, at Miloli'i the community has asked that no one lay gill net in front of the Halau; while it is technically legal, it is not considered Pono by a large number of community members.

Clearly, more information exists than what can be taught in a few hours. As a result, volunteers should watch out for opportunities to attend lectures, talks with local experts and longtime residents, and other information-sharing forums that will help to build knowledge.

2. Biological and Human Use Monitoring:

Biological and human use monitoring are critical components of Makai Watch. They not only get community members actively involved in the conservation of the area, but they also provide important information on changes in the area over time. Biological monitoring can provide information on changes in the area and changes in surrounding areas. Human use monitoring can tell you peak times for use, the main types of uses in the area, and whether or not human use changes as a result of Makai Watch or other activities. In addition, human use monitoring can be set up to track impacts of people on the area, particularly coral breakage, harassment of sea life, littering, and illegal or irresponsible activities.

A future training session will cover monitoring.

3. Observation and Compliance

This component of Makai Watch requires that a community form a relationship with DOCARE. The goal of this component is for Makai Watch volunteers to observe any violations of rules in the area and to report them to DOCARE. DOCARE would then respond right away, if possible, or would later follow up on the case. In cases where DOCARE was not able to respond right away, it is very common for DOCARE to follow up later by going to a violator's house and giving them a warning. However, in order to do this, they must be provided with a detailed report both of the violation and of how to identify the individual. It is also expected that the presence of Makai Watch participants and increased DOCARE focus on an area will encourage compliance.

As mentioned, Makai Watch requests that volunteers do not approach violators. An approach should happen only in cases of known safety—for example, a friend of yours is breaking the rules because they don't know about them. While it is a natural tendency for Makai Watch volunteers to want to approach violators, it has been demonstrated in other parts of the world that observation and reporting to authorities is enough to bring down the number of violations and to encourage compliance.

A future training session that involves DOCARE will cover observation and compliance.

What It Means to Be a Makai Watch Volunteer

The long-term goal of the **Hui Mālama o Pūpūkea-Waimea** is to replenish and sustain the natural and cultural resources of both the Pūpūkea and Waimea ahupua'a for present and future generations through active community stewardship, education and public and private partnerships.

The goal of the **Makai Watch Program** is to enhance the management of near-shore marine resources by providing community members an opportunity to become directly involved in this management.

Educating visitors is one of the most important means for reaching these goals, and volunteers are the key to educating visitors. Without volunteers' presence at the MLCD, we simply would not be able to accomplish our objectives. THANK YOU!

What are my responsibilities as a volunteer?

Training: First of all, volunteers should go through training so that the information they deliver is accurate. Though we cannot cover everything in just a few hours, there may be additional opportunities to build upon this knowledge base at later dates. We encourage you to take advantage of any opportunities you may have to learn more.

Time: We will provide the training, but you will provide the commitment to volunteer your time. You will determine when to volunteer—perhaps just before or after your regular trip to a favorite snorkel spot—and how many hours to contribute. We simply ask that if you sign up to volunteer, you show up to volunteer. If you're not able to make your shift, please let the volunteer coordinator know ahead of time.

Tracking: For general program reporting and grant-writing, we keep track of the number of contacts with the public, the number of volunteer hours logged, and other statistics as needed. These numbers may be used to help measure our effectiveness and help justify our existence. A data sheet for reporting is included at the end of the handbook.

You also will need to sign a liability waiver form, which you can find at the end of this handbook, before volunteering.

Talking: You will be providing factual information about the history, culture, and ecology of the area to users of the MLCD in a casual and friendly manner. At this MLCD, so many users are visitors to Hawaii simply don't have experience with or knowledge of coral reefs, sea turtles, and the ocean in general. The goal is to reach people BEFORE they have an opportunity to violate a rule or behave inappropriately. In most cases, people don't realize that what they do and how they do it can have negative impacts on the environment.

We will discuss in more detail how to approach people in an upcoming section.

Safety considerations

If you enter the water, you are entering at your own risk. You should be aware of dangerous marine organisms, currents, and your own strengths and weaknesses.

Please send all injured members of the public to life guards for first aid. In an emergency, call 911.

We recommend that you wear hats, sunglasses, appropriate footwear, sunscreen, and your volunteer T-shirt. Bring lots of water, too. If you have a cell phone, you might consider carrying it with you.

If you are walking around the MLCD to speak with people, it's always best to go with at least one other person.

Watch your footing, especially at Pūpūkea. Because there is not a planned entryway to the beach area and the water, the ad hoc paths to those areas are eroded and can be very slippery.

Watch for vehicular traffic. Especially during the summer dive season and winter surf contests, traffic along the highway and in the parking areas is intense. Many people may not know where they are going and may not be paying close attention.

A Brief Ancient History of the Area

Waimea Valley

The Ha'i 'ōlelo (oral history) of Waimea, according to Hawaiian historian Sam Kamakau (who was from Waialua O'ahu), begins with the high chief Kama Pua'a. Kama Pua'a, according to traditional history, was given a gift from the Kahuna Nui (high priest) Kahiki'ula. This took place sometime in the eleventh century. The gift was all the lands that begin with the word Wai. The word Waimea means "sacred water." Prior to the eleventh century, little is know about the Kānaka (people) who lived in the ahupua'a, of Waimea. The valley may have been settled as early as 400 A.D.

Waimea and Pūpūkea were given to the Papa Kahuna (priestly class) in perpetuity. Since the eleventh century, the Kahuna Nui (high priests) ruled over the valley.

Kamehameha took the island of O'ahu in 1795, and he gave Waimea Valley to his Kahuna Nui, whose name was Hewahewa. He was the last Kahuna to preside over the temples (Heiau) in the valley. Hewahewa died in 1837 and is buried in Waimea Valley. Waimea Valley, known as the "valley of the priests," was originally part of the larger moku (district) of Ko'olauloa, but was added to the district of Waialua in the 1800s.

The valley is surrounded by three major Hieau. Pu'u o Mahuka, located on the pu'u (buff) called Keanaloa, was built by Kaopulupulu, the Kahuna Nui who lived in the valley in the 1700s. Located on the Haleiwa side of the outer entrance to the valley, Kūpopolo Heiau was also built under the direction of the Kahuna Nui Kaopulupulu. Another sacred site, located on the water's edge at the southwestern side of Waimea Bay, is called Ke Ahu Hapu'u. This temple is dedicated to the shark god Kaneaukai. Pu'o o Mahuka and Kupopolo are human sacrificial temples, and Kaneaukai is a fishing shrine or temple.

Captain Cook's ships, the Resolution and the Discovery, landed in Waimea Bay in 1779. The ships anchored in the bay after Cook was killed in Kealakekua. Looking for water, the crew members were the first white men to set foot on the island of O'ahu.

Waimea was a large settlement, though the actual number of inhabitants is unknown. With an almost constant water source and abundant fishing grounds, in addition to cultivation of traditional foods, Waimea was a classic example of the Polynesian managing natural resources.

Waimea Bay became the sandalwood capital during the 1800s. Huge cargo ships would anchor offshore to load sandalwood. By the 1830s, sandalwood was beginning to disappear. The sandalwood trade soon came to grinding to a halt.

In 1898, a deluge of water in the form a huge flood drove the inhabitants from Waimea Valley. Most of them moved to the beach area and eventually moved away due to the flooding.

Kalua-Māua (Three Tables)

Kalua-Māua, also known as Three Tables due to the table-like reef outcropping, was an important area in ancient times for the gathering of water. Underwater freshwater springs bubble up from the ocean floor within the small cove area. Waimea Valley has several freshwater spring areas called puna wai, but water flow is not extensive. Since Hawai'i has no lakes or constant running rivers, it is entirely dependant upon rainfall for water. Ancient inhabitants here may have utilized the area for salt collection and fishing.

Pūpūkea (Sharks Cove)

In the Hawaiian language, Pūpūkea means "white shell." The ahupua'a of Pūpūkea, in ancient times, was not settled likely due to a lack of water and good planting soil in the upper area of the district. Fishing, however, was probably conducted, along with salt manufacturing.

The most popular features of the area are the large boulders that can be seen on the small peninsula called Kulalua. These huge boulders are said to have been a local family that were turned to stone by the goddess Pele. Tradition states that while Pele was traveling by Pūpūkea on her way to the Big Island to find a home for her fires, she noticed a group of people watching her from the shore. Upset at this development, she turned them into stone for being niele (nosey).

NĀ MO'OLELO KAHIKO...Ancient Traditions

O'AHU

The daughter of Papa the honua (earth) and Wakea the sky father. O'ahu also means to cover, wrap, or clothe.

WAIMEA

Sacred water (reddish water). Wai, water. Mea, sacred, red from ochre.

KALUA-MĀUA

One of the flat outcroppings is named after a woman who was known as Kaluamāua. They are called Three Tables today. Tradition says that whenever you saw Kaluamāua "floating" (the exposed table-like reef tops) you would find fresh water bubbling up from the ocean bed there. In times of drought, water was retrieved by diving for it and collecting it in gourds.

PŪPŪKEA (SHARKS COVE)

A stone used as an octopus lure. The name Pūpūkea also means "white shell."

The title "Sharks Cove" has a more recent history. There are two common theories on how the area got this name. One theory states that fishermen claimed that they caught sharks whenever they fished in the cove. The other theory is associated with the old railroad that used to go around the island at the turn of the century. Supposedly, when the train used to stop off near the cove to dump cattle into the water (it is unknown why), the carcasses would attract sharks to the area.

KĀNE AUKAI

One of the most important ancestral gods on the North Shore is Kāne Aukai. Kāne Aukai is an Aumakua or ancestral god. Located on the southern point of Waimea Bay is an ancient Heiau (temple). The name of this temple is Ke Ahu O Hapu'u (also the name of the bluff). The hapu'u is a type of sea bass. The tradition of Kāne Aukai begins in the distant past.

Once there lived two Kahuna who were also lawai'a or fishermen. One raised awa and the other grew 'uala or sweet potatoes. One day they both went fishing in the bay and, after many tries, they came up

empty. Time after time, they dropped their 'upena (net) but didn't catch no i'a (fish). Ready to call it a day, on the last try they pulled in their net and found a pohaku (stone) and one fish. They threw back the fish and also the stone, which was the size of a human head. Later that night, they both had a moe-uhane (dream). The next morning, one of them said, "Last night I had dream." The other man said, "I too had a dream. I dreamed that the stone said he was cold and asked me to pull him out of the ocean." To their surprise, they had dreamed the same dream.

The next day, they went fishing and retrieved the stone. They began to build a Heiau in honor of the sacred pohaku. In the dream the stone said that his body was in Waialua. They retrieved the wooden body from Waialua (it was a large piece of drift wood in the form of a human body) and united it with the stone head. As a reward for their building the temple in his honor, Kane Aukai brought an abundance of fish to the Waimea district. For many years, Waimea was famous for its multitude of fish species. The temple is still standing and is visited to this day by local fishermen, who leave offerings before fishing.

KŪPOPOLO

Located on the bluff toward the cliff is a large Heiau called Kūpopolo. The kahuna nui Kaopulupulu was the kahuna who built this temple (1700s). The ali'i nui of that time was a cruel chief called Kahahana. The chief directed the kahuna nui Kaopulupulu to construct the temple in order to detect war from Kauai. The term Kūpopolo means to see with the eyes closed. Kaopulupulu was a great prophet and oracle, but the Kahuna was unable to "see" a sign of war because the Heiau was too low on the horizon. The famous Kahuna decided to build a new temple called Pu'u o Mahuka. This temple was built high on the cliff know as Keanaloa. Pu'o o Mahuka is the largest war temple used for human sacrifice still standing today above Waimea Valley.

WAI-PU'UONE

Waimea is a famous place for surfing (he'enalu), but one of the most common forms of water sports was known as Wai Pu'uone. When the river (muliwai) was blocked by sand bars, the ancient Hawaiians rode the waves on their boards up the sand dunes and into the river mouth. Depending on how high the dunes were, it could prove to be a hair-raising event.

'ILIAHI

In 1782 Kahekili, the high chief of Maui, conquered O'ahu and disposed of the cruel chief known as Kahahana. From this time on, the kanaka (people) of the valley of Waimea were mandated to pick a "picul" a day per person or suffer the wrath of the konohiki (chief of the valley who oversaw the high chief's kanawai or laws). A picul was 138 pounds of 'iliahi or sandalwood. This kanawai or law was imposed on men, women, and able children. The once-peaceful beach head became a busy staging area for the sandalwood sold at high prices to foreign markets around the world.

By 1836 all of the sandalwood was gone. The once-bustling harbor of Waimea was abandoned. And the sandalwood trade era came to an abrupt end, bringing peace to the remaining kanaka.

However deforestation caused erosion. Eventually a huge flood in 1894 drove most of the inhabitants of Waimea to the shore and eventually out of the valley for fear of more severe flooding. The flood destroyed most of the house sites and agricultural areas. As much as 12 feet of sediment was said to have been deposited, burying most of the near-shore agricultural terraces at the mouth of the river.

ROCK CRUSHER

In 1929, C.W. Windstedt was given a contract to build Kamehameha Highway from Waimea Bay to Kahuku. He built a rock quarry in 1930 to produce gravel. The facility was abandoned in 1932. In April of 1953, the Catholic mission converted the buildings into St.Peter and Paul Church. The storage bin was converted into a church tower. It has become one of the most famous landmarks on the North Shore.

MA'I PĀKĒ

Leprosy called ma'i pākē came to Hawaii at the turn of the century. The north valley of Waimea Valley was home to a leprosy colony for several years. Eventually all of the leprosy cases were banished to Kalaupapa on Molokai. This disease, like other diseases, was introduced to Hawaii by haole (foreigners). There were no diseases in ancient Hawaii, other than asthma and arthritis. Cancer was unknown to ancient Hawaii.

HOLOHOLONA

Animals (holoholona) were brought to the islands by our Hawaiian ancestors. The only two mammals where the hoary bat (ape'a pe'a) and the Hawaiian monk seal ('ilio kai).
Hawaii has no snakes and had no mosquitoes (introduced from Panama in 1836).
Hawaii also had no flies, centipedes, scorpions, or roof or wharf rats. A small mouse called an 'iole was brought accidentally by early voyaging canoes from lower Polynesia. The word Polynesia is Latin meaning "many islands."

POHAKU LELE

In the mid 1900s, sand was mined from Waimea kahakai (beach). The sand was used to make Waikiki Beach and other resort areas. This mining exposed a large rock to ocean water. Today this huge rock outcropping is the famous jumping rock at Waimea Bay that is used by thousands of people every year.

PU'U KILO I'A

Waimea had several areas famous for fish-watching. On the Waialua side of the bay is a place used in ancient times to look for fish. Its name is Kalakoi. A person called a kilo i'a or fish spotter sat on this rock and acted as a spotter for fishermen. Located on the Kahuku side of the bay is another famous rock used for fish sighting; this rock was called Kalaku. These fish-spotting areas are also known as Pu'u kilo i'a.

KALUA MĀUA

Fresh water (Wai hou) was the most important item in ancient Hawaii. Access to fresh water was allocated and shared. Because Hawaii nei has no natural lakes (except a small glacial lake on Mauna Kea), ancient Hawaiians depended entirely on rain for fresh water. In times of drought, water was collected in caves and puna wai or springs. Another way to collect water was to dive in the ocean and collect water from freshwater springs in gourds. Kalua Māua, more commonly called Three Tables today, was an area known for its freshwater springs bubbling up from the ocean floor.

Living close to the 'apapa (reef) was a fisherman and his wife. One night the wife went fishing. Not being able to see her from their home, the man went looking on the reef for his wife. He found her in the form of stone floating on the reef. It is said that whenever this stone is found, there is fresh water in the ocean.

PELE'S FOLLOWERS (Nā ukali o Pele)

When the goddess Pele arrived here from Tahiti (some think Samoa since Pele is a Samoan name), she landed on Ni'ihau first, then Kauai, and eventually found a place to keep her fires at Kīlauea. After digging on each island and reaching the seawater, she eventually found Hawaii, where she dug with her O'o and did not reach water. Here she found a home for her fire. In Pana'ewa she planted her staff, and it became a tree.

On passing through the island of O'ahu, Pele tried her staff (called Pāoa), at Leahi (known today as Diamond Head), Aliamanu (known today as Salt Lake), and Makapu'u. While sailing through Pūpūkea, Pele came across a family watching her from the reef at Kalualoa. Angered at them being ni'ele (nosey), she turned them into stone. For hundreds of years, these large upright boulders have stood as sentinels. During the 1960s, a huge winter wave knocked over the largest of these boulders. These large boulders are known as Nā ukali o Pele, the followers of Pele. Their names are Paka'a, Kuapaka'a, Hina Alualumoana, and the two young boys are known as O'opuhalako'a and Holoholoua.

Cultural Activities in and around the Pūpūkea MLCD

Native Hawaiian Cultural Activities

Pu'u O Mahuka Heiau: The largest Human sacrificial temple still standing today on the island of O'ahu is located above Waimea Valley on the bluff overlooking the Bay. Built in the 15th or 16th century, the Heiau was a powerful war temple dedicated to the war god Kū. Consisting of several terraced enclosures, it is maintained and managed today by Nā Hoa O Pu'u O Mahuka, a curator group. Ho'ike (tours) are given to schools and other native Hawaiian groups who visit the area by appointment. The site is on the National Historic Sites list and is considered a state park. It was placed on this list by executive order in the 1960s. Speaking Hawaiian is encouraged to all workers while working at the Heiau.

Pūpūkea Recreation Center: The Pūpūkea recreation center holds weekly Hawaiian language classes given to adults. The class has been in existence since 1995. History and culture, along with local history, is shared at the center during classes. Students provide their own material, while the instruction is at no charge to the community.

Ka lua loa: Located on the 'āpapa (reef) called Kalualoa are several large boulders. They are known by Native Hawaiians as Pele's followers. Hawaiian Mo'olelo (tradition) says they represent a whole family that was turned to stone by Pele for being niele (nosey).
It was said that Pele caught the family spying on her as she paddled her canoe past Pūpūkea. Currently a husband-and-wife team regularly measure to determine whether the huge boulders have moved (possibly from wave action). It is unknown if their measurements or recorded movements will be made public or when the unofficial survey will conclude.

Nā Pohai Mākua: The Pūpūkea seniors group, called Nā Pohai Mākua, use the Pūpūkea Recreation Center to hold lessons and hula practice. Hawaiian language and traditional chants are shared by this group. They perform at North Shore functions periodically. Awana (modern) and kahiko (ancient) hula are practiced by these kūpuna.

Church of Hawai'i nei: The church of Hawai'i nei, established in the late 1970s, perpetuates Hawaiian political and religious protocols. Its leader, Maui Loa, is also an artist and entrepreneur.

Beach weddings: Waimea Bay, Kalua Māua (Three Tables), and Pūpūkea (Sharks Cove) are popular sites for sunset weddings. Several native practitioners perform ceremonies at these locations for visitors and locals alike.

Makahiki ceremonies: Several Hawaiian Kahuna Pule (priests) conduct contemporary Makahiki ceremonies at Pu'u o Mahuka Heiau. Many of them end their circuit of the island at the Heiau. The traditional makahiki was led by a high chief as he made a circuit of the island collecting auhau (taxes). The god of rain and winter, Lono, was carried in the procession by an attendant.

Waimea Valley: Waimea Valley Audubon Center currently hosts Native Hawaiian groups who come to the valley to maintain the temple sites located there. These groups consist of Hawaiian students and residents. They practice traditional protocol methods while working at these sacred sites.

Waimea Valley also has a resident archaeologist who gives hands-on archeological techniques and outreach programs to local school groups and visitors. Stream tours and tours through the many ancient sites are also conducted. Several local hula halau give cultural performances in the valley periodically. Ongoing diverse educational programs are shared with patrons of the center.

Hui Mālama i nā Kūpuna: Hui Mālama I nā Kūpuna has a chapter located in Pūpūkea. This Hawaiian organization assists the state of Hawai'i in matters of repatriation of uncovered ancient grave sites and remains of native Hawaiians when found during construction work or other impacts.

Miscellaneous

There are several ocean-related archeological sites such as Ke Ahu o Hapu'u; a Midden site at the base of a large rock; and Kalakoi and Kalaku fish lookouts.

There are salt pans in the coral at Sharks Cove, where they were once used for pa'akai gathering.

Waimea Bay can be found throughout the history books, as it was used as an anchorage by passing ships (Resolution & Discovery, for example).

The area is popular for surfing, outrigger canoeing, paddleboarding, swimming, snorkeling, diving, and even water polo. There are numerous contests for various sports held in Waimea Bay.

Waimea Bay is a popular place for funerals (Jose Angle, Mark Foo, Eddie Aikau, etc.)

The entire MLCD area is a popular subject of artistic expression through various mediums of photography, painting, drawing, etc.

The Pūpūkea Marine Life Conservation District

MLCDs in Hawaii

There are 11 Marine Life Conservation Districts in Hawaii, with three on Oahu—Pūpūkea, Hanauma Bay, and Waikiki. According to the State Division of Aquatic Resources (DAR) Web site, MLCDs are "designed to conserve and replenish marine resources. ... They provide fish and other aquatic life with a protected area in which to grow and reproduce."

The Birth of the Pūpūkea MLCD

The North Shore Neighborhood Board was approached in the 1970s by divers who expressed an interest in better management for the Pūpūkea area. Marine life was becoming more and more scarce, according to divers and fishermen alike, and the increased use of the area by commercial dive operators and fishermen was sited as a possible reason. The State's Department of Land and Natural Resources (DLNR) initiated public meetings in 1978 to discuss what to do. Fishermen were not opposed to making the area a Marine Life Conservation District (MLCD), but they didn't want to be restricted from accessing the area; they especially wanted to be able to traverse the area to get to a popular spearfishing site. The Pūpūkea MLCD was officially created in 1983, with certain types of fishing and limu collecting still allowed.

Expanding the Pūpūkea MLCD

By the 1990s, the DLNR recognized that the existing rules were too difficult to enforce and began discussing amendments to the rules. The North Shore Neighborhood Board again got involved, drafting amendments to the rules and presenting them to the DLNR. State Senator Robert Bunda and Representative Alex Santiago convened a task force of stakeholders, who recommended rules changes to the DLNR. After a public hearings process, the area of the MLCD was expanded, and rules were revised several times—most recently in 2003.

MLCD Regulations (From the State DLNR's Division of Aquatic Resources)

Boundaries

The Pūpūkea MLCD includes the submerged lands and overlying waters beginning at Kulalua point and extending seaward due west (270 degrees) to a point 100 yards offshore at a longitude of 21_39' 44" N Latitude 158_03' 89" W, then south to the most seaward exposed rock of Wananapaoa islets on the southern end of Waimea Bay.

Definitions

- "Akule" means any fish of the species *Selar crumenophthalmus* and the various life stages known as pa'a'a, hahalalu, halalu, and mau.
- "District" means the Pūpūkea Marine Life Conservation District.
- "Finfish" means any of the various species of marine life that uses fins to swim, not including turtles or mammals.
- "Hook and line" means a length of line to which is attached one or more hooks. A weight and pole may be added to this.
- "Legal nets" means one that is not in violation of any law, rule, or regulation.
- "Limu kohu" means any seaweed known as *asparagopsis taxiformis,* or limu lipe'epe'e.

- "Net" means any device of mesh material made into various shapes.
- " ʻŌpelu" means any fish of the species *Decapterus.*
- "Opihi" means any mollusk of the genus *Cellana.* This animal is also called koʻele, alinalina, maka-ia-uli, and limpet.
- "Personal safety" means any defensive action to prevent bodily harm.
- "Snag" means the act of pulling a line with one or more hooks for the purpose of hooking the fish anywhere except by the mouth.
- "Spear" means any device used to impale fish.
- "Take" means to catch or confine fish from land or boat or swimming.
- "Trap" means to use any device that is used to confine aquatic life.
- "Waimea Bay" means that portion of the district from Wananapaoa to Waimea point.

Prohibited activities

It is unlawful for any person to engage in the following activities within the MLCD:

1. To catch, fish, take, or remove any finfish, crustacean, mollusk, including sea shell and opihi, live coral or other marine life, or eggs.
2. Take, alter, deface, possess or remove sand, coral, rock or any geological feature.
3. Have or possess in the water, any spear, trap, net, crowbar, or any device used to alter any geological feature.

Permitted activities

1. A person may take and possess any finfish with hook and line from the shoreline of Waimea Bay only and use no more than two poles with one line per pole and no more than two hooks per line.
2. Take and possess any ʻŌpelu with legal nets from Waimea Bay only during August and September.
3. Take and possess any Akule with legal nets from Waimea Bay only during November and December.
4. Possess within the MLCD any knife for the sole purpose of "personal safety."
5. Take and possess limu kohu and limu lipeʻepeʻe within the MLCD provided that the roots and holdfast are not taken. No person shall possess no more than two pounds of either species (squeezed dried) for a combined total of two pounds each per day.

Exemptions and permits

1. Permits may be issued for scientific, propagation, or other purpose.
2. Terms and conditions may be imposed.
3. Infractions of a permit may cause termination of permit.
4. Penalty for a violation of a permit could lead to a misdemeanor offense.

<u>Biological Activities in and around the Pūpūkea MLCD</u>

Public Park: The park along the immediate shoreline is under the jurisdiction of the City and County of Honolulu.

Hawaiian Islands Humpback Whale National Marine Sanctuary: The National Oceanic Service manages the sanctuary, which is a seasonal home to an estimated 4000 to 5000 humpback whales. Here, the whales breed, calve, and nurse their young; this is the only place in the U.S. that these whales reproduce. The Sanctuary includes waters off Maui, the north shore of Kauai, the north and south shores of Oahu, and the Kohola coast of the Big Island.

State Department of Health: The D.O.H., through its Clean Water Branch and Environmental Planning Office, posts three kinds of water quality warnings: Brown-Water advisories related to storm runoff, High Indicator Bacterial Advisories, and Sewage Spills. The latest D.O.H water quality test was taken from Kalualoa, Sharks Cove, on January 5 2006.

U.S. Geological Survey's Pūpūkea Road Rain Gage: Daily samples are taken from the Pūpūkea rain gage located 1,060 feet above mean ocean level.

U.S. Geological Survey's Kamananui (Waimea) Rain Gage: Daily samples are taken from an elevation of 720 feet above mean ocean level.

Hawaii Coral Reef Initiative (Research Program): Principal analysis has been done on the effectiveness of Marine Managed Areas and MLCD zones. Results from the Pūpūkea MLCD appears to have shown little or no change and no increase in fish.

Federal Environmental Protection Agency: The EPA has a program called Beach Watch, and Hawaii is one of the states receiving funds for environmental monitoring. Periodic testing is done at major beach sites. The most recent water-quality tests conducted in or near the Pūpūkea MLCD were taken on January 10, 2006. This information is found online at "BEACON"—Beach Advisory and Closing Online Notification.

Surfrider Foundation/Rashguard.org: Rashguard is an organization which conducts testing or receives results from samples collected. The last Rashguard tests taken in or around the Pūpūkea MLCD were taken on December 29, 2005, at Waimea Bay.

University of Hawaii, Botany Department: Currently there is an ongoing study (conducted by Koa Shultz) of a rare Limu in the Pūpūkea MLCD. The Hawaiian name is not known at this point, but the scientific name for the species is *Peleophycus*. Current research has shown that the Limu can be found only in the springtime, but it cannot be found every spring. It is unknown if the plant alternates or grows only under certain conditions. Research is ongoing.

NOAA/NOS/NCCOS/CCMA, Pūpūkea MLCD Study: A recent statewide study of MLCDs titled "Fish Habitat Utilization Patterns and Evaluation of the Efficacy of Marine Protected Areas in Hawai'i" was conducted by Friedlander, Brown, Monaco, and Clark. The final report was dated November 14, 2005. This was a statewide study covering eleven MLCDs.

Results showed that in the Pūpūkea MLCD, overall fish weight was four times higher in the MLCD compared to the outside areas open to fishing. Of the eleven MLCDs tested, Pūpūkea fell somewhere around the middle in relation to fish weight and reef life. Fish weight outside the MLCD was considered low (likely due to overfishing).

Major fish found in the MLCD were *maikoiko*, *maiii*, *naenae* and *umaumalei*. No major apex fish such as *ulua*, or *'omilu* were found. Outside the MLCD, *Hinalea lauwili* and *maiii* were common. Coral cover was 10%. Macroalgae was found to be low inside the MLCD but higher outside.

Awareness Raising and Outreach

As mentioned previously, you will be providing factual information about the history, culture, and ecology of the area to users of the MLCD. Your role is not to bombard visitors with rules and facts, but to help people understand the area better, teach appropriate behavior, and promote appreciation and stewardship of the area. The most important thing is to interact with people in a positive, warm, friendly, and respectful manner.

This handbook and training course provides historical, cultural, and ecological information about the MLCD that you can share with visitors. In a nutshell, though, key messages about appropriate behaviors are as follows:

- Take only photos.
- Leave nothing behind.
- Do not stand on or touch coral, including coralline algae; it's best to stand on the sand.
- Do not feed the fish or other marine life.
- Respect protected species. For example, Federal law prohibits approaching a sea turtle closer than 100 yards.

Whether you're sitting at an entry point or walking around the area, you'll probably find that your volunteer T-shirt will attract attention from people with questions. You can also approach people yourself to share stories, photos, and other information. You are not expected to know everything and can certainly tell a person, "I don't know." Here are a few tips:

- Always be courteous. Approach by saying "excuse me."
- Identify yourself as a Makai Watch volunteer.
- Briefly explain the purpose of Makai Watch.
- Provide some basic information about the area, including regulations and major Pono Practices or Behaviors. Then let people decide for themselves how to behave.
- Direct people to the kiosk or information area (if there is one), should they have any questions.
- Try to keep the entire interaction to under three minutes unless the individual engages you in conversation.
- If the person is violating a regulation, assess the situation carefully before approaching. As a rule of thumb, Makai Watch asks participants not to approach a violator but instead to take a report and call DOCARE. Only in cases where it is very clear that the violator can be approached without causing any harm to you or anyone else, you may want to approach them and provide the same basic information as to any ocean user. A good example may be a family that you know is picnicking at Pūpūkea and one of their teenagers has a spear. The teenager enters the water with the spear. You may feel comfortable approaching the parents since you know them to make sure they know that the area is a MLCD and that swimming with a spear or spearing fish is not allowed. Typically, however, when Makai Watch participants are patrolling, they are asked not to approach violators.
- Never engage in a debate or argument with anyone that you approach.
- Don't touch anyone.
- If you feel that any harm may come to you or anyone else, immediately leave the individual, making any necessary apologies to keep the situation calm.
- Don't contradict authority figures.

Basic Coral Reef Ecology

The Importance of Hawaii's Reefs

Hawaii is home to the majority all the coral reefs in the United States (including all U.S. territories and affiliate States). With an average of 25% endemism in corals, reef fish, and other reef-related species, Hawaii's reefs are among the top one or two most unique reef systems anywhere on earth. In the past, the coral reef ecosystems of the Main Hawaiian Islands supported rich fisheries that provided protein for local communities and maintained a deep connection to the traditional fishing culture of Hawaiian ancestors. Today coral reefs and associated near-shore marine ecosystems continue to provide fish and other products for commercial, recreational, and subsistence activities. Likewise, reef systems in Hawaii provide up to 7,000 local jobs in the dive and tourism industry and support at least 1,000 small businesses across the State. The majority of reef ecosystems on inhabited islands are in severe decline, where fish biomass is over 200% less than on the uninhabited atolls in the Northwest Hawaiian Islands.

What are coral reefs?

Coral may look like a colorful rock, but it is actually a living animal. Corals belong to a group of animals that include sea anemones, jelly fish, and hydroids. These animals have tentacles with stinging cells (nematocyst) and a single opening in the body. This group is known as the Phylum Cnidaria.

Corals are actually small **polyps** that create reefs by secreting limestone skeletons. Coral polyps divide as they grow and form coral colonies, over thousands of years creating a coral reef.

Each individual polyp harbors symbiotic algae, called **zooxanthellae**. Zooxanthellae use sunlight to make oxygen and food that the polyps use, and the polyps, in turn, produce wastes that the zooxanthellae need. Thus, coral reefs can only grow where water is clear enough to allow adequate light penetration for photosynthesis.

Not all corals build reefs, however. Soft corals, which include sea fans, sea plumes, and sea whips, are important components of coral communities.

Coral reefs provide food and shelter for many fish and invertebrates. For example, sea turtles shelter in reef overhangs and forage for sponges and other food items; manatees feed in reef-associated seagrass beds.

What is a polyp?

Corals have a type of body form called a polyp. A polyp is a can-like body with a single opening leading to the stomach, surrounded by a ring of tentacles. Sea anemones and hydroids also have this type of body.

How do corals grow?

The coral colony grows by budding. A single coral polyp will split in two, making an identical copy of itself. The polyps formed by budding are connected to each other by a thin layer of skin. This thin skin layer allows the entire colony to benefit from any nutrients obtained by the individual polyps.

How are coral reefs formed?

Coral reefs are formed from coral skeletons. Corals secrete a hard skeleton of limestone (calcium carbonate) as protection for the coral polyps. Each polyp makes a small skeletal cup, called a calyx, which it hides in when inactive or threatened. As the coral colony grows it must secrete new skeletal material on top of the old. Over thousands of years the accumulation of skeletal material forms a coral reef.

What do corals eat?

Corals primary food source comes from a type of microscopic algae in their tissue called zooxanthellae. The zooxanthellae and coral have a symbiotic relationship, meaning each organism benefits from the other. Like other plants, the zooxanthellae in the coral tissue uses photosynthesis as a means of harnessing the sun's light and converting it to nutrients. Some of these nutrients, like oxygen and sugars, are used by the coral. The coral also produces waste products that the algae can use. Carbon dioxide, nitrates, and phosphates are waste products of the coral but important nutrients for the zooxanthellae. This recycling of nutrients allows corals to thrive in the nutrient poor waters of the tropics. Corals also feed on small planktonic animals. Corals use their tentacles to capture prey. The tentacles contain stinging cells called nematocysts. When an animal brushes against the nematocyst a spear-like projection shoots out and captures the animal.

What do corals need to survive?

Corals need three things to survive: warm water, sunlight, and clear shallow water. Coral can not grow in waters colder than 20 degrees Celsius (68 deg. F). Corals need the sunlight and clear, shallow water so that the zooxanthellae in their tissues can photosynthesize. In waters that are either too deep or too murky, the zooxanthellae does not get enough light to photosynthesize. This is why reef building corals are generally not found below 100 meters (330 feet) deep.

How important are coral reefs to our environment?

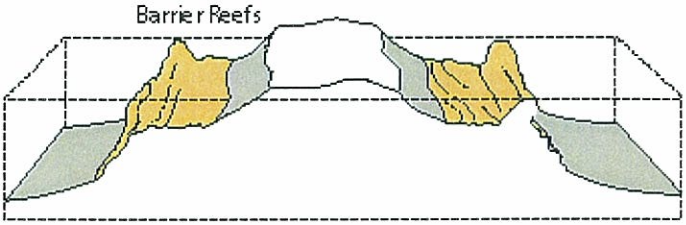
Coral reefs are tremendously important economic and environmental resources. They offer these and other benefits to our environment:

- Coral reefs provide habitat to a number of fish and marine species, including many that we rely on for food and economic purposes. They support a complex and biodiverse community, creating a biologically rich oasis in waters that otherwise are not highly productive.
- Reefs protect harbors and beaches from the heavy wave action of coastal storms, keeping shorelines from being washed away and creating safe anchorages for boats.
- Coral reefs provide an important recreational and aesthetic resource for people visiting or living in coastal areas. People use coral reefs for fishing, underwater photography, scuba diving, and snorkeling.
- Reefs serve as a laboratory for students and scientists to study and learn about complex ecological processes. In addition, reefs yield biological treasures that are increasingly being recognized as natural sources of biomedical chemicals.

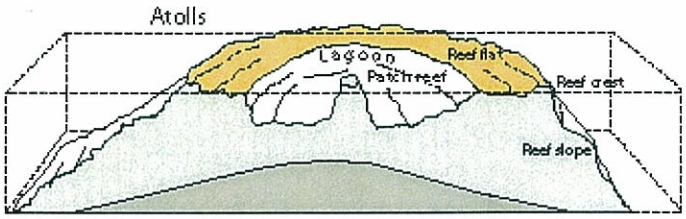
How are coral reefs structured?

Coral reefs form in regions of the world where there are warm currents, mainly between the Tropics of Cancer and Capricorn. There are four main reef types: fringing, barrier, atolls, and patch reefs.
Fringing (or apron) reefs directly border shorelines:

Barrier reefs are similar to fringing reefs except that they are separated from the shoreline by lagoons that are often deep and wide:



Atolls are circular-shaped reefs that form on the rim of submerged volcanic islands; **patch reefs** are small, isolated formations that are not attached to a major reef structure:



What types of corals are in Hawaii?

Corals come in many shapes and sizes. In Hawaii we have six dominant corals; lobe, shelf, rice, finger, cauliflower, and blue. Corals get their common name from how they look. The shape of a coral is determined both by how they build their skeleton and the environmental factors with which they must cope. In shallow areas with high surf you find corals with low, sturdy forms like lobe, rice, blue, and cauliflower coral. Branching, delicate corals such as shelf and finger coral are found in calmer or deeper waters.

What is coral bleaching?

Certain types of stressors, such as increased sea surface temperatures or toxic exposures to oil, can cause coral polyps to lose their pigmented zooxanthellae, or to "bleach." Bleaching occurs naturally and is caused by various environmental stresses, including increased or decreased light, reduced salinity, or in the case of mass bleaching, elevated sea surface temperatures.

Bleaching can damage or kill coral, depending on the severity and duration of the temperature increase, and the sensitivity of the individual coral species. Corals can survive mild bleaching, as zooxanthellae have some ability to recover, but severe bleaching may kill nearly all the corals affected. Corals that withstand bleaching still suffer reproductive impairment, slowed growth, and decreased ability to calcify and repair themselves.

How do humans harm corals?

Anthropogenic (human-caused) sources of reef mortality include pollution, physical impacts and overfishing.

Climate change detrimentally impacts coral in several ways. Levels of atmospheric carbon dioxide are increasing, causing rises in sea surface temperature (SST). The rise in SST, in turn, increases the frequency and severity of coral bleaching. Levels of carbon dioxide are also increasing in seawater, resulting in weaker coral skeletons, reduced coral extension (growth) rates, and an increased susceptibility to erosion on reefs. Climate change is also linked to greater frequencies of severe storms, which are a major cause of physical damage to reefs.

Land based runoff, including excess nutrients, pollutants, and sediments, can harm coral, particularly when these impacts are ongoing.

Coral reef habitats are also sensitive to **physical disturbance**. Ship groundings, which destroy reef structures, create coral rubble that can do further damage when storms pound the reef. Large debris, from shipwrecks or other sources, can have similar impacts.

Overfishing is pervasive on many coral reefs, even in areas previously considered undisturbed. Heavy fishing both decreases biodiversity (reduces the number of species living in an area) and shifts the ecosystem structure of fish and reef communities. (Although the evidence isn't conclusive, ecologists generally believe that losing biodiversity makes an ecological community more unstable, and hence more vulnerable to stresses.) Destructive fishing practices, such as the use of dynamite and poisons, common in some areas of the Pacific, directly damage and kill coral.

Ecology of the Pūpūkea MLCD

Why is the Pūpūkea MLCD Biologically Special?

The Pūpūkea MLCD is one of the very few places in Hawaii where an unchannelized stream flows into a MLCD and where both marine and terrestrial resources are actively managed. Although far from the ancient Hawaiian ahupua'a management system, it is a step in that direction.

The entire Pūpūkea MLCD receives high wave activity in the winter months, mobilizing underwater boulders even at depths of 40 feet. Therefore it is educationally valuable as a study of high-wave impact zones because the wave activity has a profound affect on the ecology of the MLCD. Coral cover is relatively low, for example, and those that do live in the area are species that can withstand pounding waves.

Currently there is an ongoing study (conducted by Koa Shultz) of a rare Limu in the Pūpūkea MLCD. The Hawaiian name is not known at this point, but the scientific name for the species is *Peleophycus*. Current research has shown that the Limu can be found only in the springtime, but it cannot be found every spring. It is unknown if the plant alternates or grows only under certain conditions. Research is ongoing.

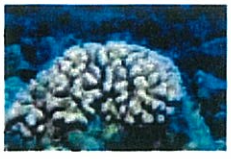
Submarine caves are scattered around the MLCD and general area, including around the northeast point of the Pūpūkea cove.

Pūpūkea (Sharks Cove) is one of the most popular shore-entry destinations for snorkelers and SCUBA divers on Oahu, second only to Hanauma Bay. Pūpūkea has a depth of about 20 feet at the mouth of the cove. Diving is considered to be better outside the cove, where depths slope to about 45 feet. Waters just around the "tables" at Kalua-Māua are about 15 feet deep, and diving is considered to be better farther out at 30 to 45 feet.

Corals

The coral reef communities of the Pūpūkea MLCD have to contend with large swells every winter. So the coral cover is relatively low (10%) and includes mainly wave-resistant species. Encrusting coral dominate. According to a University of Hawaii CRAMP study, the most common corals in the MLCD are pōhaku puna (lobe coral) and cauliflower coral. Also present are crust coral, corrugated coral, and blue rice coral. CRAMP also reported finding the rare coral *Montipora studeri* in the area.

Pōhaku puna, lobe coral, *Porites lobata*
(Photo from www.hanauma1.com/fish/coral.htm)



Cauliflower coral, *Pocillopora meandrina*
(Photo from www.coralreefnetwork.com)

Crust coral, *Leptastrea purpurea*
(Photo from www.coralreefnetwork.com)

Corrugated coral, *Pavona varians*
(Photo from www.coralreefnetwork.com)

Rice coral, *Montipora studeri*
(Photo from www.coralreefnetwork.com)

Fish

A recent statewide study of the 11 MLCDs titled "Fish Habitat Utilization Patterns and Evaluation of the Efficacy of Marine Protected Areas in Hawai'i" was conducted by Friedlander, Brown, Monaco, and Clark. The final report was dated November 14, 2005.

Results showed that in the Pūpūkea MLCD, overall fish weight was four times higher in the MLCD compared to the outside areas open to fishing. Of the eleven MLCDs tested, Pūpūkea fell somewhere around the middle in relation to fish weight and reef life. Fish weight outside the MLCD was considered low (likely due to overfishing).

Major fish found in the MLCD were māikoiko (whitebar surgeon), mai'i'i (brown surgeon), na'ena'e (orange band surgeon), and umaumalei (orange spine unicornfish). No major apex fish such as ulua, or 'omilu were found outside the MLCD. Hinalea (saddle wrasse) lau wiliwili (milletseed butterfly fish) and mai'i'i (brown surgeon) were common.

The University of Hawaii CRAMP study found that the most abundant fishes were the hinalea (saddle wrasse), while the mai'i'i (brown surgeon) had the highest biomass.

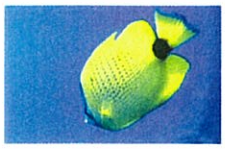
The most abundant fishes from these two studies are pictured on the next pages.

Hinalea, saddle wrasse, *Thalassoma duperrey*
(Photo from coralreefnetwork.com)

Mai'i'i, brown surgeonfish, *Acanthurus nigrofuscus*
(Photo from coralreefnetwork.com)

Na'ena'e, orange band surgeon, *Acanthurus olivaceus*
(Photo from The Nature Conservancy)

Umaumale, orange spine unicornfish, *Naso lituratus*
(Photo from The Nature Conservancy)



Lau wiliwili, milletseed butterflyfish, *Chaetodon miliaris*
(Photo from The Nature Conservancy)

Oval chromis, *Chromis ovalis*
(Photo from www2.hawaii.edu/loseylab/chromis.htm)

Blackfin chromis, *Chromis vanderbilti*
(Photo from coralreefnetwork.com)

Brighteye damsel, *Plectroglyphidodon imparipennis*
(Photo from coralreefnetwork.com)

Pacific Gregory, *Stegastes fasciolatus*
(Photo from coralreefnetwork.com)

Ōmaka, belted wrasse, *Stethojulis balteata*
(Photo from coralreefnetwork.com)

Māikoiko, whitebar surgeon, *Acanthurus leucopareius*
(Photo from coralreefnetwork.com)

Kole/Yellow-eyed kole, goldring surgeon, *Ctenochaetus strigosus*
(Photo from coralreefnetwork.com)

Fishermen report that the various species of uh (parrotfish) found in the MLCD are important to them.
Uhu'ahu'ula (initial) and Uhu uliuli (terminal), spectacled parrotfish, *Chlorurus perspicillatus*
(Photo from The Nature Conservancy)

CRAMP also found the Moray eel, uncommon for the area:
Puhi, Moray eel, *Gymnothorax eurostus*
(Photo from coralreefnetwork.com)

Butch Helemano spoke with longtime residents and fishermen of the area, who report that Pūpūkea used to be home to the Mo'olio, or seahorse.
(Photo from www.seahorse.com)